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Growth Behavior Of White Pine In An Uncut Stand In Southwestern Maine

Measurements of growth in a white pine stand in the Massabesic Experimental Forest over a 15-year period show that some trees contribute more than three times as much volume as other trees of the same size and species.

Fourteen ¼-acre plots were measured in 1937 and again in 1952. These plots were in a rather open, mixed stand of white pine, hemlock, and scattered hardwoods. In 1952 the trees were 60 to 70 years old. An average of less than two trees per acre, usually smaller than 8 inches in diameter, died in the 15-year interval.

During the 15-year period, the volume per acre on the 14 plots increased from 7,750 board feet to 14,675 board feet (table 1). In terms of compound interest, this is an increase of 4.3 percent per year. (Three-fourths of the volume is in white pine, one-fifth in hemlock, and the rest in hardwoods.)

Since trees grow at different rates, even when they are the same age, some trees contribute more of the growth per acre than others. To show these variations, the trees in each species and diameter group were divided into three classes (as of 1937). Class 1 is the slowest growing, Class 3 the fastest.

The percentage increase in volume is faster for smaller trees, while board-foot increase is faster for larger trees. Therefore, growth was expressed both in board feet and as a percentage (tables 2 and 3).

The average annual growth has been 462 board feet per acre during the 15-year period. White pine, with the greatest number of trees per acre, accounted for 360 board feet. More than half of the white pine growth (51 percent) was put on by the fastest-growing one-third of the trees (table 4).

The number of years a tree needs to grow one inch in

Table 1.--Growth behavior of white pine stand, 1937-52

Diameter group in 1937 (inches)	White pine			Hemlock			Hardwoods[1]		
	Trees	Volume per acre[2]		Trees	Volume per acre		Trees	Volume per acre	
		1937	1952		1937	1952		1937	1952
	No.	Bd.ft.	Bd.ft.	No.	Bd.ft.	Bd.ft.	No.	Bd.ft.	Bd.ft.
5-8	43	--	978	21	--	398	43	--	136
9-12	35	2,394	4,694	11	637	1,170	7	331	414
13-16	15	2,690	4,456	4	506	727	--	--	--
17+	2	740	1,100	2	450	604	--	--	--
Total	95	5,824	11,228	38	1,593	2,899	50	331	550
	No.	Cu.ft.	Cu.ft.	No.	Cu.ft.	Cu.ft.	No.	Cu.ft.	Cu.ft.
5-8	43	239	386	21	80	140	43	137	204
9-12	35	548	894	11	134	208	7	104	124
13-16	15	483	751	4	85	122	--	--	--
17+	2	124	175	2	76	98	--	--	--
Total	95	1,394	2,206	38	375	568	50	241	328

[1]Red maple, red oak, black oak, and white oak.

[2]Board-foot volume in International $\frac{1}{4}$-inch rule. Cubic-foot volume from local volume table.

Table 2.--Average growth per tree per year, in board feet

Diameter group in 1937 (inches)	White pine, by growth class--			Hemlock, by growth class--			Hardwoods, by growth class--		
	1	2	3	1	2	3	1	2	3
5-8	0.34	1.31	2.88	0.31	1.11	2.24	0.04	0.16	0.44
9-12	2.06	4.21	6.80	1.73	3.41	4.67	.28	.72	1.38
13-16	5.34	7.82	10.56	2.32	3.72	5.00	--	--	--
17+	8.56	10.52	12.35	2.64	5.36	7.33	--	--	--
Average	3.55	6.60	10.49	2.38	5.15	7.93	0.06	0.29	0.68

Table 3.--Average growth per tree, 1937 to 1952, in percentage

Diameter group in 1937 (inches)	White pine, by growth class--			Hemlock, by growth class--			Hardwoods, by growth class--		
	1	2	3	1	2	3	1	2	3
9-12	2.5	4.5	6.3	2.5	4.3	5.4	0.4	1.5	2.6
13-16	2.5	3.4	4.3	1.6	2.5	3.1	--	--	--
17+	2.2	2.7	3.1	1.1	2.1	2.7	--	--	--
Average		3.8			3.1			1.5	

Table 4.--Distribution of annual board-foot increment per acre

Species	Growth class--			Total
	1	2	3	
White pine	62	115	183	360
Hemlock	13	29	45	87
Hardwoods	1	4	10	15
Total	76	148	238	462

Table 5.--Number of years to grow 1 inch in diameter

Diameter group in 1937 (inches)	White pine, by growth class--			Hemlock, by growth class--		
	1	2	3	1	2	3
9-12	13	7	4	13	7	5
13-16	7	5	4	11	7	5
17+	6	5	4	13	7	5

diameter is a good guide to its thrift and condition (table 5). Pine and hemlock, in stands such as the one sampled, should grow 1 inch in diameter in less than 7 years. More than half the trees grew slower than this; they yielded less than 3 percent increment.

There is a marked difference in growth rate between trees of the same species as well as between different species. Even unmanaged, well-stocked, thrifty stands can be expected to grow more than 450 board feet per acre yearly when the trees are about 60 years old. In this particular stand, 20 percent of the trees (faster-growing white pines) produced 48 percent (225 board feet) of the annual per-acre growth.

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